

of this plant is the *Cryptostemma Calendulaceum*, that it is an annual, making its appearance in the spring of the year, and, that although it has now become so common, it is not indigenous to Victoria, but was brought originally from the Cape of Good Hope. Since its introduction, however, it has spread very rapidly, and is now gradually working its way into the interior, where it is much disliked, as it forms only indifferent pasture for animals, and when it dies away, which it does during the summer months, it leaves the country quite bare, and almost as black as if it had been passed over by a bush fire. The substance which I am introducing to your notice grows upon the seeds of this plant, which seeds it would be necessary to remove by machinery before it could be made available for manufacturing purposes. The fibre is rather short in staple, but as it is of a curly nature I believe that its want of length would not be detrimental to its uses, especially as, although very fine, it is also exceedingly tough. I have been informed by a hatter in Melbourne that it would form a good material for the manufacture of felt hats, and I have very little doubt that it could also be converted into textile fabrics and paper. I should like very much to see it turned to useful account, as its collection would give employment to numbers of children as well as to aged and infirm people, a description of labour which now finds very little occupation in the colony. With this view I have therefore sent a parcel of it to the Exhibition in order that it may be experimented upon in Europe, and I now bring it to the notice of the Royal Society.

ART. XII.—*On the Coal Seams near Stony Creek (junction of Singleton and Wollombi roads), West Maitland district, New South Wales.* By Rev. W. B. CLARKE, M.A., F.G.S., &c.

[Read 23rd December, 1861.]

The position of coal-seams at this locality has been urged by me on various occasions, and in a preceding paper, on the Geological Relations of the Maranoa District (Queensland), as proving the greater antiquity of the genera *Glossopteris*, *Phyllothea*, &c., than is usually assigned to them.

The recent railway-cuttings from Maitland to the back of Harpur's Hill, and to Singleton, have afforded good opportunities for testing the character of the formation in which the seams are situated.

West Maitland Station is 16 feet above the sea; Lochinvar Station, 200; and, according to my measurement, Harpur's Hill is 385 feet above the sea, the highest level in the cuttings between them being 300 feet. To the Wollombi-road Station the distance from West Maitland is 2 miles, and from the Lochinvar Station $4\frac{1}{4}$ miles. This line occurs on the south side of the hill in which the coal-pits have been sunk, and at the distance of half a mile. On the north side, the main road from Maitland to Harpur's Hill meets the road from Stony Creek, the former nearly parallel with the railway line, and the latter transverse to it. The summit of the hill is about 160 feet above the sea, the slopes falling gradually to Maitland and to Stony Creek.

From West Maitland and 2 miles further (East Maitland), to about $2\frac{1}{2}$ miles towards Lochinvar, the whole country is occupied by a succession of beds of sandstone, grit, and calcareous concretionary rock, full of fossils of Palæozoic age, such as *Spirifers*, *Producti*, *Conulariæ*, *Orthoceratites*, *Asteriadae*, *Pachydomi*, *Eurydesmæ*, *Fenestellæ*, *Bellerophon*, &c., which are exposed in the cuttings, and in quarries, and on surface blocks. They all dip more or less to points between E. and S.S.E., but where the rock is highly concretionary and nodular there is an apparent divergence or meeting of dips, where two concretionary nodular masses come together: and in such case, the surface dip may be towards N.E. This is the case in the lower part of Stony Creek, which has a short course between such masses. But in the railway line the beds covering the more solid portions dip persistently in the same direction.

At the point indicated above, these beds begin to be troubled by infusions of amygdaloidal trap, or by basalt, and thence to Harpur's Hill, the igneous and sedimentary rocks irregularly alternate, Harpur's Hill itself consisting of concretionary masses and beds partially derived from igneous matter, and containing fossils of the same Palæozoic formation, which Professor M'Coy has long ago determined to be at the base of the "Lower Carboniferous" formation of Ireland. The strike of the main axis of the intrusive dyke of Trap, and of the minor dykes that cut through the sedimentary deposits, is from N.W. to S.E. On the N.W. side

of Harpur's Hill, the dip of the beds is reversed, and falls in that direction towards Black Creek, similar phenomena exhibiting themselves in the structure and texture of the deposits, in the association of Palæozoic fossils with silicified wood, patches of coal, detritus of granite, porphyry, lydian-stone, &c., on the surface, which have been derived from the disintegration of out-cropping fossiliferous conglomerates and sandstones, the latter of which are partly a *péperino* or "ash." In the railway cuttings, the trap is seen to have been partially contemporaneous with the sedimentary deposits, and partially of later date, as is the case in the Illawarra District. At the axis of the anticlinal, the trap is found in rounded boulders on the edges of the outburst, in the midst of the fossiliferous rocks.

The diagram (No. 1) represents a section on the north side of Harpur's Hill. No. 2 gives the horizontal section from Maitland to Anvil Creek, in which the coal-seams of Stony Creek, and of the falls to Black Creek, are shown in reverse order, proving that they really belong to the succession of the beds in which they occur. The Trap which thus forms an anticlinal is a spur belonging to Duguid's Hill, a little to the southward of Harpur's Hill, and it breaks out in that direction at the head of Black Creek, and is probably the cause of the divergent drainages from the great bend of the Hunter to the parallel of 33° S.

By reference to Mitchell's map of the colony in 1854, the state of the case will be understood. The Myall Range along the 33rd parallel, and the country north of it to the Hunter, including Ellalong and Tomulpin Hill, and some part of Wallis Creek up to Maitland, consists of the Palæozoic fossiliferous formation. The Sugar Loaf and Buttai Ranges, with the mountainous ground to the south of the Myall, including the ranges to Broken Back, consist of beds above that formation.

On Mulberring Creek, over the fossiliferous beds, coal occurs; in the Buttai Range the sandstones, &c., abound with glossopteris and other plants. The Watagon and Broken Back country consists of Hawkesbury rocks, and the summit of Warrawolong is of trap, resting on the latter.*

On the north side of the Hunter, the Palæozoic fossiliferous rocks rest on porphyry, which exhibits itself in massive

* I was upon it in 1843, but then had no barometer with me. It is not lower than 2,000 ft.

hills at intervals from Port Stephen's Heads to the 151st meridian.

Near the junction of the William's River with the Hunter (where porphyry enters largely into the formation of the pebbles in the fossiliferous conglomerate of Muree), and along the Myall the dip is south-easterly, at about the same angle, 16° , as at Stony Creek coal-pits. Eastward of the Buttai Range, and so to Newcastle, the coal basin of the latter locality occupies the country, seams cropping out at intervals as far as Waburg Head and Tuggerah, in the coast cliffs.

It will be seen from the above topographical account, that about Maitland, the Four-mile Creek, and Greenhill, coal seams of the Newcastle basin are separated from the Stony Creek coal by the Palæozoic fossiliferous beds, that ascend from the sea level at Maitland to the height of nearly 400 ft. in the line of section No. 2.

The consideration of all these facts will show the importance of that section. But, although for nearly twenty years I have been working out the details of the country in question, and have long been acquainted with all the local phenomena, I have not had so valuable a comment on them as has been afforded by the railway cuttings and the coal-pits near Stony Creek.

The section (No. 2) shows a depression above the coal. This represents a small gully excavated by atmospheric waters in the outcrop of the softer beds. The proprietor (the Hon. Bowen Russell, M.L.C.), having given directions to form a garden in that hollow, found traces of coal, and very judiciously put down a shaft to the dip of the outcrop so accidentally discovered. He has since made a second shaft a little to the S.E. of the former, but owing to water it is not now wrought. The beds passed through in the new pit (Pit B), above those with which Pit A begins, are represented in section No. 2 in the stratigraphical order, and the continuation of that pit is carried on past the beds in which Pit B ends. As the beds were the same in each below Bed 4, this is the most convenient mode of representing the series. At the time of my last visit, I found experimentally that there was 40 feet of water in Pit B. Water became very troublesome at the fifth bed of that pit.

There seems to be some occasional irregularity in the beds; but the dip given in the section is the mean dip from 16° to 20° . The size of the shaft is 10 ft. 6 in. in diameter.

The depth of Pit A is 208 ft., and of Pit B 190 ft. 7 in. : the whole section, including the lowest boring, being 289 ft.

The coal is partly cannel, partly splint, and soft coal. They appear to be about equal in gas ; the cannel burns to a white ash, the others to a brown ash. The specific gravity of the large seam I make 1.281. The coal in the corresponding seam on the N.W. side of the anticlinal is nearly the same. The coal is worked on the dip for about 30 yards, and it is sold at the pit's mouth at eleven shillings per ton.

The extension of these seams to any great depth is limited in all probability by a band of porphyritic trap, that ranges from Maitland in a southern direction. But with the dip of 16° , if persistent, it ought to be struck at a depth of 500 fathoms below West Maitland. Probably, however, it does not attain such an extension, if the supporting porphyry base has a gentle acclivity. The deepest coal reached in the Newcastle basin, is, at present, under 500 ft. below the sea level. In reference to some of the peculiarities relating to these coal fields, I may refer to the evidence I gave before the Legislative Council of New South Wales in the year 1847, a copy of which I forward with this memoir.*

Mr. Keene, Inspector of Coal Fields, has been very diligent in his observations, and probably possesses details of some minuteness respecting the locality in question. I doubt not he will confirm all the main features reported by me.

As to the depth of the Newcastle field, had a recommendation made by me to the Government in 1856 been attended to, the bottom of that basin would probably have been ascertained ; as it is, we only know that the beds are very irregular, thinning and thickening out, and that there are, perhaps, seams yet deeper than any yet reached.

* *Report on Coal Inquiry, 16th September, 1847, pp. 6, 7.* I wish to remark that I now refer to this evidence only in connection with the *stratigraphical* and not with the *palæontological* facts.